Effect of COVID Pandemic on Exercise Patterns in APFP Participants

A RESEARCH PAPER

SUBMITTED TO THE GRADAUTE SCHOOL

IN PARTIAL FULFILLMENT FOR THE DEGREE

MASTER OF SCIENCE

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MUNCIE, INDIANA

MAY 2021

Introduction

The benefits of physical activity (PA) and exercise have been demonstrated across the lifespan. We are meant to move and many of our body's systems work better when we are consistently physically active. For managing symptoms of decrease in fitness levels, weight gain, elevated blood pressure, and overall quality of life, some research suggests that elevated levels of combined aerobic and resistance activity may be associated with greater reductions in these negative symptoms brought on by the COVID-19 isolation. Therefore, improving host immunity and mitigating the negative effects of the virus via PA is strongly justified.

Initiating a sudden quarantine state implies a radical change in the lifestyle of the population. These lifestyles and behaviors in many cases include a certain level of PA and exercise to maintain an adequate health status, to counteract the negative consequences of certain diseases, such as diabetes, hypertension, cardiovascular disease (CVD), respiratory diseases, or even simply to guarantee an active aging by reducing the risk of frailty, sarcopenia and dementia, as associated diseases in older people (3). On the other hand, PA and exercise have shown to be an effective therapy for most of the chronic diseases with direct effects on both mental and physical health. In fact, exercise has been considered the real polypill based on epidemiological evidence of its preventive/therapeutic benefits and considering the main biological mediators involved (4).

Briefly, the reason to promote PA and exercise for improving physical fitness components is that these (cardiorespiratory fitness or CRF, muscular strength, and flexibility) are directly related with the physiological functions of the main organ systems

(respiratory, circulatory, muscular, nervous and skeletal systems) and indirectly implicated in the appropriate functioning of other systems (endocrine, digestive, immune or renal systems) (7). For all this, PA/exercise become especially essential for older people during quarantine because to maintain physiological function and reserve of most of the organ systems could contribute to the fight against the mental and physical consequences and severity of Covid-19 (4). The principal elements we should consider to design a proper exercise prescription for older people confined at home are exercises that follow a specific frequency, intensity, time, and type (FIIT principle), which is what is taught to by the Adult Physical Fitness Program (APFP) cohort of individuals in this study. The APFP is designed for adults who can be classified as low or moderate risk for developing cardiovascular disease (according to national guidelines from health and medical organizations); however, the program does provide services for some individuals with chronic diseases. This project will specifically look at the PA status of participants in the APFP evaluating overall health and effects of being physically active or physically inactive during the lockdown due to the global pandemic.

Background Information

Exercise should be done in moderate intensities and volumes during the current pandemic, which is a nutritionally, psychologically, socially challenging environment in the presence of a virulent viral organism (5). Proactively creating innovative health promotion models with technology and government involvement with the best available evidence should be encouraged to reduce physical inactivity during the current COVID-19 pandemic and after (4).

Ideally, the general public is advised to adhere to the standard World Health Organization (WHO)/American College of Sports Medicine (ACSM) recommendations of at least 150 minutes per week of moderate-intensity aerobic PA or at least 75 minutes of vigorous-intensity aerobic PA throughout the week and 2 sessions per week of muscle strength training. During confinement, individuals should avoid sedentary behavior as much as possible. If watching TV, one should get up periodically or if working on your computer get up and walk 2-3 minutes every 20 minutes (1). Walk around the home or do an active chore like sweeping the house or gardening.

Performing some activity has shown to have positive health benefits compared to no activity. All adults should strive to ultimately achieve a total of at least 150 minutes per week of moderate-intensity aerobic PA or at least 75 minutes of vigorous-intensity aerobic PA throughout the week and 2 sessions per week of muscle strength training. Previously sedentary and physically inactive individuals should start with some activity, starting with light intensity such as a slow walk around the house for 10-15 minutes per day and gradually progress to achieve the above general recommendations. Research suggests not to start unaccustomed exercises but do functional exercises as able such as walking, marching, stepping, sit up from a chair (1). Adults greater than 65 years are advised to follow the same recommendations as younger adults. The older adults who cannot do so should be active through light activities and avoid sedentary behavior as functionality allowable. Individuals diagnosed with one or more chronic conditions (diabetes, heart disease, high blood pressure, cancer, etc.) who were previously assessed by a physician and were active can follow the above adult guidelines (1). If an individual is on a weight reduction program, it is better to maintain weight without

excessive exercise.

Special attention is deserved for the elderly population group, because in older people PA and exercise impact the mentioned benefits on many diseases but also has additional effects on hallmarks of aging and associated diseases. In this sense, exercise in older people positively affects and prevents frailty, sarcopenia, risk of falls, self-esteem and cognitive impairment or decline (1). Therefore, to not totally interrupt or change the lifestyle of people during quarantine and to maintain an active lifestyle at home is very important for the health of the overall population but, especially, for those with additional risk factors and older people. Clearly, we would support the message of "doing at least some exercise is better than nothing", however, a more precise prescription and recommendation are needed to guarantee an appropriate exercise prescription aimed to maintain or improve the principal health related physical fitness components (6).

Blood Pressure

Blood pressure is not constant or flat; rather it is cyclical or undulating. The heart is a life-giving pump that is constantly working to circulate blood through the blood vessels in the body. If your BP is too high, this then puts an extra strain on the arteries and the heart and this may lead to a cardiac event or a stroke (3). Systolic blood pressure (sBP) represented as the top number indicates how much pressure your blood is exerting against your artery walls when the heart beats. Diastolic blood pressure (dBP) represented as the second number indicates how much pressure your blood is exerting against your artery walls while the heart is resting between beats. Typically, more attention is given to sBP as a major risk factor for cardiovascular disease for

people over 50 (11).

Generally speaking, sBP rises steadily with age due to the noticeable increase in stiffness of large arteries, long-term buildup of plaque and an increased incidence of cardiac events or diagnosis of CVD (11). It has shown that active subjects have a lower risk of becoming hypertensive than do sedentary subjects. Moreover, many researchers have shown that a single episode of exercise is able to reduce blood pressure during the recovery period. In addition, meta-analyses have concluded that aerobic training is effective in reducing clinical blood pressure in the general population as well as in hypertensive patients (7). Despite these well-known benefits, analyzing the effects of exercise is complex. The complexity comes from the varying population, exercise, and the type of blood pressure measurement being utilized. Knowing that, the effects of exercise on the blood pressure of this cohort might be different in normotensive and hypertensive subjects, because cardiovascular hemodynamics are modified differently based on overall health, age and sex.

Body Weight (BW)

Excessive BW is associated with numerous negative health outcomes that include, but are not limited to CVD, diabetes, some forms of cancer, and musculoskeletal disorders (5). Recent estimates indicate that the prevalence of overweight (body mass index [BMI], 25–≤30 $kg \cdot m^2$) in the United States for adult men is approximately 39% and 27% for adult women (3), with estimates of obesity (BMI ≥30 $kg \cdot m^2$) for men being approximately 38% and for women being 40% (4). Given the high prevalence of overweight and obesity, there is an ongoing need for effective treatment

and prevention methods. Moreover, professional organizations have also identified PA as an important behavior that contributes to BW regulation (6).

Muscular Fitness

The health benefits of enhancing muscular fitness are well established (8). Higher levels of muscular strength are associated with a significantly better cardiometabolic risk factor profile, lower risk of all-cause mortality, fewer CVD events, lower risk of developing physical function limitations, and lower risk for nonfatal disease (6). There is an impressive array of changes in health-related biomarkers that can be derived from regular participation in resistance training including improvements in body composition, blood glucose levels, insulin sensitivity, and blood pressure in individuals with various mild or moderate chronic diseases (2). Exercise that enhances muscle strength and mass also increases bone mass and bone strength of the specific bones stressed and may serve as a valuable measure to prevent, slow, or reverse the loss of bone mass in individuals with osteoporosis. Additionally, resistance training can reduce pain and disability in individuals with osteoarthritis and has been shown to be effective in the treatment of chronic back pain (4).

Physical Activity & Cardiorespiratory Fitness

PA and exercise are often used interchangeably, but these terms are not synonymous. PA is defined as any bodily movement produced by the contraction of skeletal muscles that results in a substantial increase in caloric requirements over resting energy expenditure (1). Exercise is a type of PA consisting of planned, structured, and repetitive bodily movement done to improve and/or maintain one or more components of CRF. CRF has been defined in several ways, but the generally

accepted definition is the ability to carry out acts of daily living with vigor and alertness, without undue fatigue, and with ample energy to enjoy leisure-time pursuits and meet unforeseen emergencies. CRF is composed of various elements that can be further grouped into health-related and skill-related components (1).

In addition to defining PA, exercise, and CRF, it is important to clearly define the wide range of intensities associated with PA. Methods for quantifying the relative intensity of PA include specifying a rate of perceived exertion value (RPE), heart rate, or metabolic equivalents (METs). Each of these methods for describing the intensity of PA has strengths and limitations (11). Maximal aerobic capacity usually declines with age. For this reason, when older and younger individuals work at the same MET level, the relative exercise intensity will usually be different. In other words, the older individual will be working at a greater relative percentage of maximal oxygen consumption than their younger counterparts. Nonetheless, physically active older adults may have aerobic capacities comparable to or greater than those of physically inactive younger adults (1).

Data Collection and Analysis

We chose Numbers software charts to show the process of evaluating overall fitness and vital levels pre and post pandemic. The obtained values noted in charts 3 and 4 for body weight (BW) and BP (sBP and dBP) were constructed in Numbers, represented in the form of a paired, two tailed t-test used to determine whether the mean difference between the two sets of observations was zero. In this paired sample t-test, each subject was measured twice, resulting in pairs of observations, however, only the sBP for the men was statistically significant (.007) out of all of the BP and BW

values pre and post pandemic. Charts 1 and 2 represent the mean and corresponding standard deviations which shows how spread out the data is, measuring how far each observed value is from the mean. There was no standard deviation close to zero indicating that the data points are respectively above the mean. Lastly charts 5 and 6 are both self-reported values based on subjective opinions on levels of muscular fitness, PA, CRF, flexibility, and overall organized exercise. The key for these charts is listed below providing necessary information on the level of activity with the corresponding percentage of change from pre to post pandemic. According to the survey both sexes reported to be consistently the same in all departments measured except for a few notable changes such as the men having a higher PA level post pandemic (45%), lower flexibility level (68%), and lower exercise participation (56%). Whereas the women reported to be more physically active (64%) post pandemic. Most of these results showed little significance and were not anticipated due to the lack of facilities, equipment, supervision, weather conditions and motivation.

Chart 1:

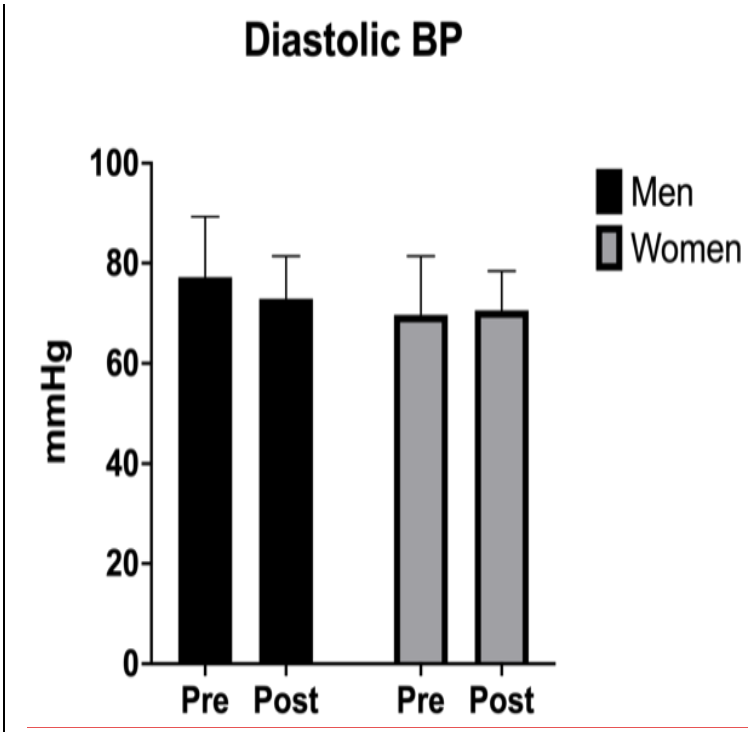
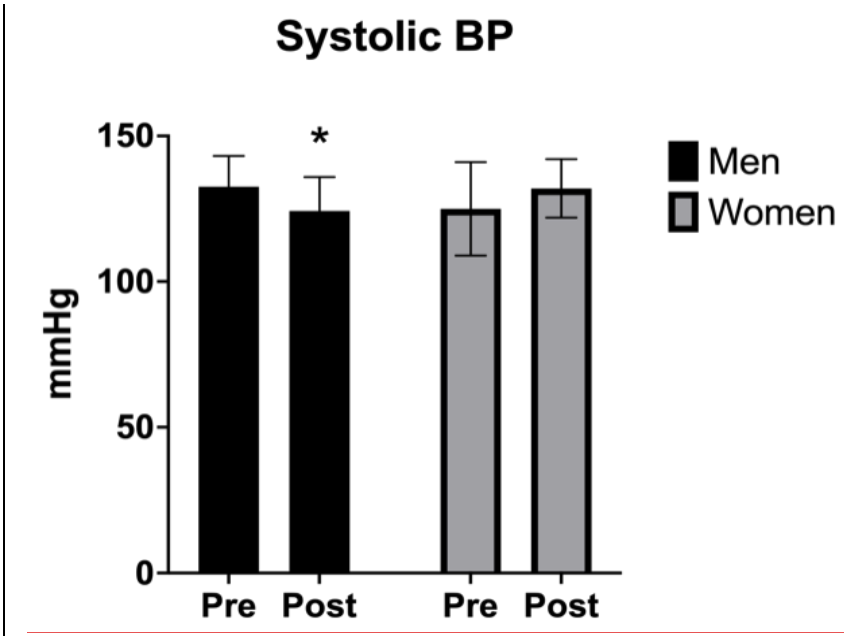


Chart 2:



Key for Chart's 5-6:
Green- 1 on the scale (lower than pre)
Blue- 2 on the scale (about the same pre to post)
Yellow- 3 on the scale (more than pre)

Note: The following chart's (5 and 6) provides percent change of various facets of fitness levels adapted using recommendations from American College of Sports Medicine Guidelines for Exercise testing, prescription and lifestyle choices such as those represented in the charts below.

Chart 5:

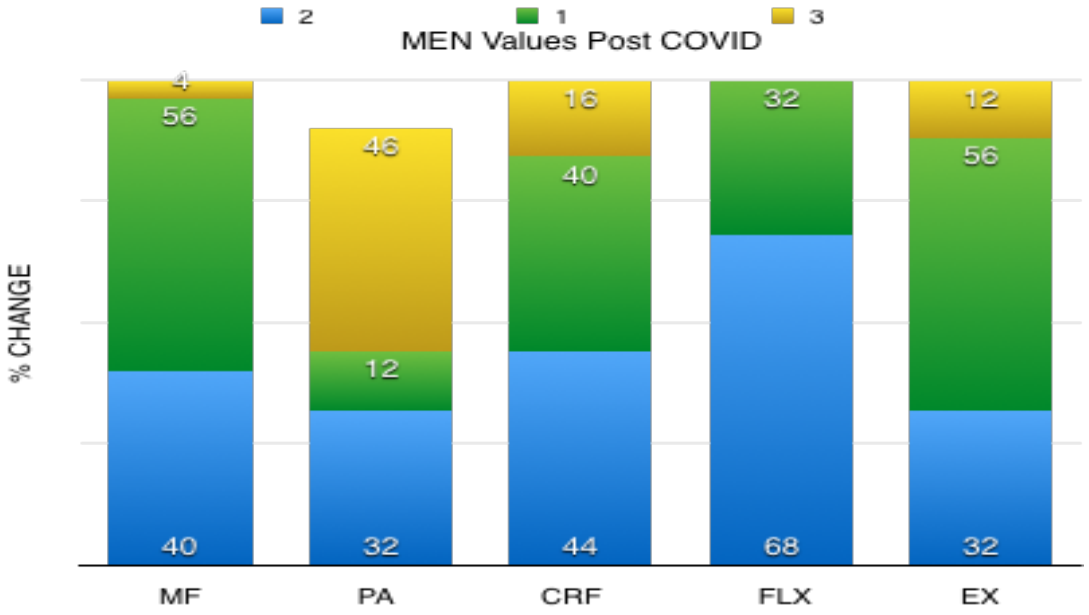
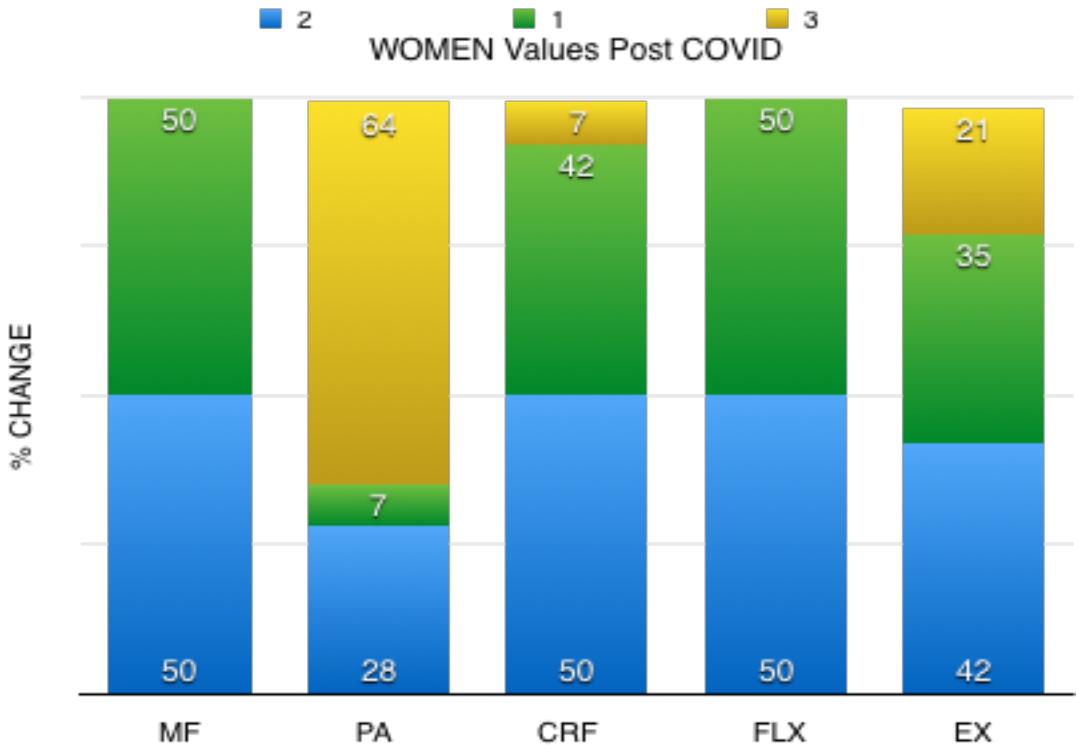


Chart 6:



Summary

In closing, exercise remains a cornerstone therapy for the primary prevention, treatment, and control of overall well-being and quality of life measured in the various objective and subjective data gathered from this study. Maintaining PA levels during the COVID-19 outbreak will have significant physical health benefits to all participants. Thfs study found that BP and BW values were not significant pre to post pandemic, however, overall perceived well being and fitness gathered from the subjective/self reported surveys was shown to be consistent or better when looking at pre and post values (chart 5 and 6). A limitation to this finding is that we did gather various levels per participant and did into account for diet, nutrition, environmental factors, stress, lifestyle habits and other underlying health conditions that may have been responsible for the insignificance findings of the BP and BW values pre and post pandemic. Further data will be needed to evaluate the role of exercise in preconditioning, planning and formation of exercise prescriptions with participants prior to isolation to try and keep away from possible infection or decline in quality of life.

Physically active individuals should modify their exercise program in response to variations in their exercise capacity, habitual activity level, and the available environment during isolation. Although many sedentary individuals can safely begin a light-to-moderate intensity exercise program, all individuals should participate in the exercise pre participation screening process to determine the need for medical clearance (4). Exercise professionals who supervise exercise and fitness programs should have current training in basic and/or advanced cardiac life support and emergency procedures similar to the APFP staff. These emergency procedures should

be reviewed and practiced at regular intervals. Finally, individuals should be educated on the signs and symptoms of CVD and other chronic diseases and then should be referred to a physician for further evaluation should these symptoms occur.

Needs for future research within the evidence from this review supporting that PA contributes to the prevention of weight gain and obesity, and the maintenance of a healthy BW. The review of evidence also has identified a number of areas for additional research, and these research needs are specifically on those components as well as an overall health assessment from a primary care provider pre and post pandemic to ensure all facets of health are in check going forward with acts of daily living and exercise.

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